20. Alpha Construction Company has five crews. The skills of the crews differ from one another because of the difference in the composition of the crews. The company has five different projects on hand. The times (in days) taken by different crews to complete different projects are summarized in following table. Find the best assignment of the crews to different projects such that the total time taken to complete all the projects is minimized.

Projects execution times in days.

		Project				
		A	B	C	D	E
Crew	1	20	30	25	15	35
	2	25	10	40	12	28
	3	15	18	22	32	24
	4	29	8	34	10	40
	5	35	23	17	26	45

APRIL/MAY 2024

CASC32/FASC32/BASC32 — QUANTITATIVE TECHNIQUES – I

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define the term operation research.
2. Write any two applications of operations research.
3. Write the methods for the solution of a linear programming problem.
4. Write the characteristics of linear programming problem.
5. Define Big-M method/Penalty method.
6. Form the dual of the following problem.

Maximize $Z = 4x_1 + 10x_2 + 25x_3$

Subject to

$2x_1 + 4x_2 + 8x_3 = 25$

$4x_1 + 9x_2 + 8x_3 = 30$

$6x_1 + 8x_2 + 2x_3 = 40$

x_1, x_2 and $x_3 \geq 0$.

14. (a) Find the initial basic feasible solution for the following transportation problem using North-West Corner Method.

	Destination			
Sources	D1	D2	D3	Supply
S1	3	8	5	7
S2	4	4	2	8
S3	6	5	8	10
S4	2	6	3	15
Demand	8	10	22	

Or

(b) Obtain the initial basic feasible solution of the following TP using Least Cost Method.

Factory \ Store	A	B	C	Availability
P	10	8	8	8
Q	10	7	10	7
R	11	9	7	9
S	12	14	10	4
Requirement	10	10	8	

15. (a) A company has 4 machines to do 3 jobs. Each job can be assigned to only one machine. The cost of each job on each machine is given below. Determine the job assignments that will minimize the total cost.

		Machine			
		W	X	Y	Z
Job	A	18	24	28	32
	B	8	13	17	18
	C	10	15	19	22

Or

(b) Solve optimally the following assignment problem.

		Job			
		I	II	III	IV
Mechanics	A	42	35	28	21
	B	30	25	20	15
	C	30	25	20	15
	D	24	20	16	12